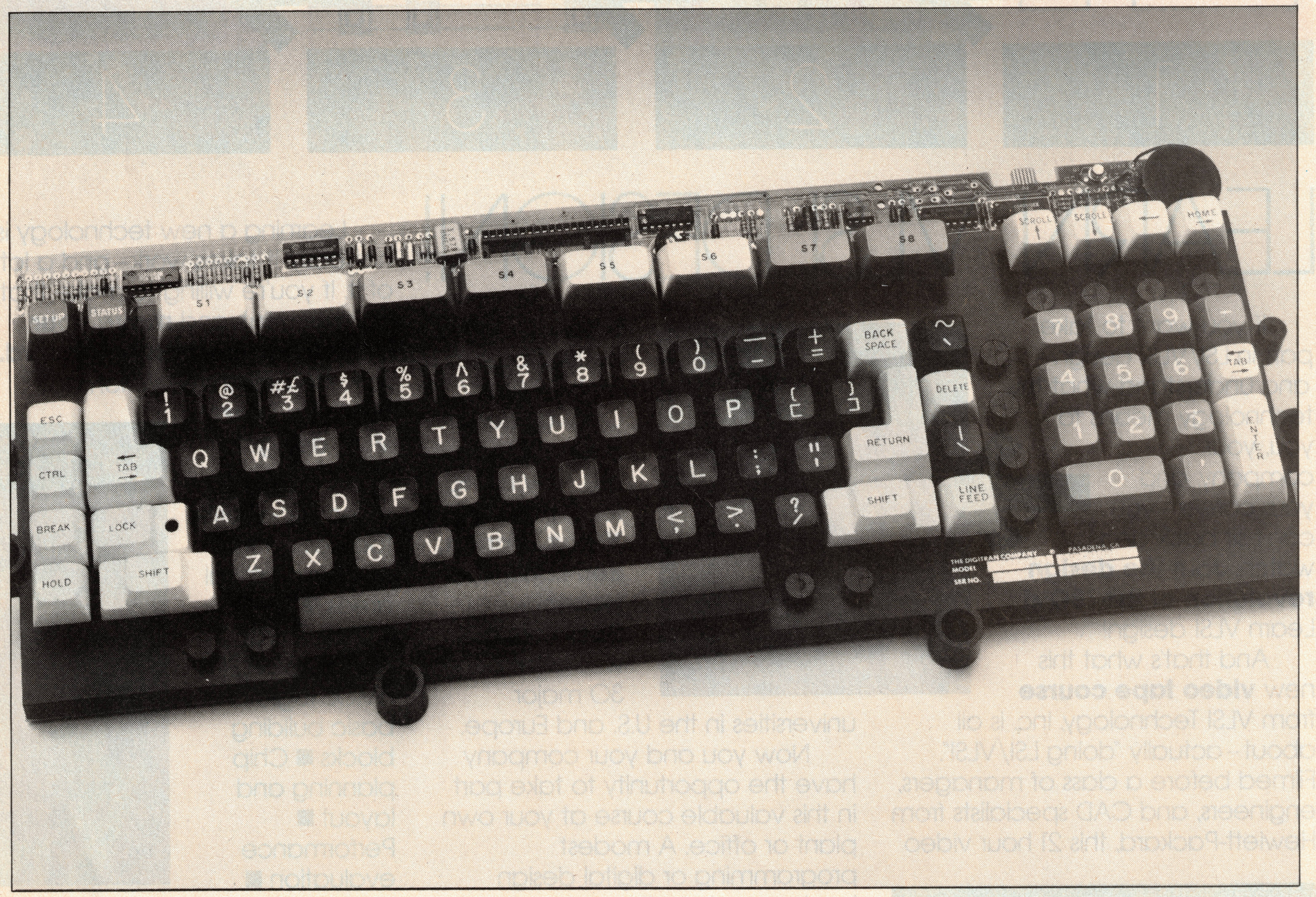
Our name is on the keyboard, but your name is on the line.


SET UP
STATUS
S1
S2
S3
S4
S5
S6
S7
S8
SCROLL
SCROLL
HOME
ESC
CTRL
BREAK
HOLD
TAB
LOCK
SHIFT
BACK SPACE
DELETE
RETURN
LINE FEED
SHIFT
TAB
ENTER
THE DIGITRAN COMPANY
PASADENA, CA
MODEL
SER NO.

When your design team chooses a keyboard for your new business-computer, word-processor or other new application, you know your products' success will be based in large part on that keyboard . . . how it feels, how it looks, its functions, features and reliability.

That's why so many companies specify Digitran's capacitive switch technology.

People tell us that the "tactile feel" of our keyboards beats anything they've ever used. Effortless, but positive.

Digitran keyboards make your product look better because we make everything (except the IC's) in house. We control the color, the finish and the aesthetic appeal for maximum marketing impact.

Specifications? Yours. Custom or standard. We'll design to U.S. specs or the new European DIN specs. We can provide any function you specify and many features you may not be aware of. If your specifications call for a standard application keyboard, we have those, too.

Application by application the Digitran keyboard has built a proven record of field-tested reliability.

You may already be using Digitran keyboards. If you aren't, remember: Your product is only as good as its keyboard. Is your product as good as it could be? If you aren't sure talk to your design team. Then write or call: Director of Marketing, Keyboard Division.

DIGITRAN™

The Digitran Company, a division of Becton, Dickinson and Company
855 South Arroyo Parkway • Pasadena, California 91105 • Phone: (213) 449-3110 • TWX 910-588-3794, TELEX 67-5485

Electromatrix printing reduces terminal noise

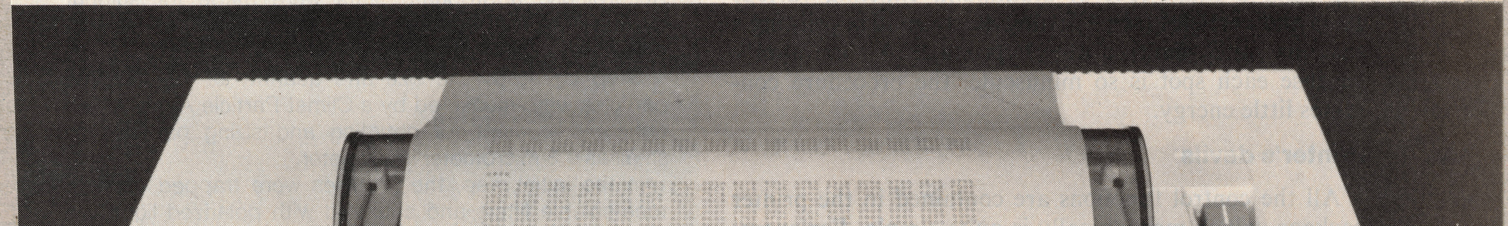
Low-energy printing technology leads to small fast terminals that require no adjustments and very little service

by Humberto Cordero Jr., *IBM Corp., General Technology Division, Endicott, N. Y.*

□ A half millennium or so since he revolutionized printing, Johann Gutenberg would be hard-pressed to recognize the technology his latter-day electronics-engineering counterparts have devised. A new process for character formation reverses the traditional deposition of dark material on a lighter background by removing light-reflecting aluminum from a black underlayer, quickly, quietly, and at low cost—ideal for desktop terminals and printers (Fig. 1). The old printers' devils cringing and scurrying at barked commands have given way to several microprocessors programmed by microcode to set uncomplainingly and efficiently about their tasks.

Electromatrix printing, as the process is known, yields a dense array of dots at high speed and with low energy consumption. It involves the selective removal of portions of a very thin (0.1 micrometer) layer of aluminum that overlays a black undercoat, 5 μm thick, atop paper. The basic concept is that, since so much of the visible spectrum is reflected off a metal layer whose thickness is less than the light's wavelength, the surface appears white. In contrast, the black layer, with a thickness orders of magnitude greater than the wavelength, absorbs the light very efficiently.

The characters are formed by a print head consisting of 18 circuit wires that form an array of electrodes nine high by two wide (Fig. 2). As this array passes horizon-



1. Hush, hush. The 3232 electromatrix printing terminal is very quiet because of the nonimpact, low-energy printing process. It is also small, fast, and reliable, thanks to the overall simplicity of the process and the company's no-adjustment design philosophy.

Cromemco System One
CROMEMCO 3102

New Cromemco System One shown with our high-capability terminal and printer.

A new small computer that won't limit you tomorrow

Here's a low-priced computer that won't run out of memory capacity or expandability halfway through your project.

Typically, computer usage tends to grow, requiring more capability, more memory, more storage. Without a lot of capability and expandability, your computer can be obsolete from the start.

The new System One is a real building-block machine. It has capability and expandability by the carload.

Look at these features:

- **Z80-A processor**
- **64K of RAM**
- **780K of disk storage**
- **CRT and printer interfaces**
- **Eight S-100 card slots, allowing expansion with**
  - **color graphics**
  - **additional memory**
  - **additional interfaces for telecommunications, data acquisition, etc.**
- **Small size**

GENEROUS DISK STORAGE

The 780K of disk storage in the System One Model CS-1 is much greater than what is typically available in small computers. But here, too, you have a choice since a second version, Model CS-1H, has a 5″ Winchester drive that gives you **5 megabytes** of disk storage.

MULTI-USER, MULTI-TASKING CAPABILITY

Believe it or not, this new computer even offers multi-user capability when used with our advanced CROMIX* operating system option. Not only does this outstanding O/S support multiple users on this computer but does so with powerful features like multiple directories, file protection and record level lock. CROMIX lets you run multiple jobs as well.

In addition to our highly-acclaimed CROMIX, there is our CDOS*. This is an enhanced CP/M† type system designed for single-user applications. CP/M and a wealth of CP/M-compatible software are also available for the new System One through third-party vendors.

COLOR GRAPHICS/WORD PROCESSING

This small computer even gives you the option of outstanding high-resolution color graphics with our Model SDI interface and two-port RAM cards.

Then there's our tremendously wide range of Cromemco software including packages for word processing, business, and much more, all usable with the new System One.

ANTI-OBSOLESCENCE/LOW-PRICED

As you can see, the new One offers you a lot of performance. It's obviously designed with anti-obsolescence in mind.

What's more, it's priced at only $3,995. That's considerably less than many machines with much less capability. And it's not that much more than many machines that have little or nothing in the way of expandability.

Physically, the One is small — 7″ high. And it's all-metal in construction. It's only 14⅛″ wide, ideal for desk top use. A rack mount option is also available.

CONTACT YOUR REP NOW

Get all the details on this important building-block computer. Get in touch with your Cromemco rep now. He'll show you how the new System One can grow with your task.

---

*CROMIX and CDOS are trademarks of Cromemco Inc.
†CP/M is a trademark of Digital Research

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Tomorrow's computers today

Circle 91 on reader service card

Now you can get a terminal as easy to use as a VT100 no matter what kind of terminal you need.

"My own IBM computer. Imagine that."

One nice thing about having your own IBM Personal Computer is that it's *yours.* For your business, your project, your department, your class, your family and, indeed, for yourself.

Of course, you might have thought owning a computer was too expensive. But now you can relax.

The IBM Personal Computer starts at less than $1,600† for a system that, with the addition of one simple device, hooks up to your home TV and uses your audio cassette recorder.

You might also have thought running a computer was too difficult. But you can relax again.

IBM PERSONAL COMPUTER SPECIFICATIONS
*ADVANCED FEATURES FOR PERSONAL COMPUTERS

User Memory
16K - 256K bytes*
Permanent Memory
(ROM) 40K bytes*
Microprocessor
High speed, 8088*
Auxiliary Memory
2 optional internal diskette drives, 5¼", 160K bytes per diskette
Keyboard
83 keys, 6 ft. cord attaches to system unit*
10 function keys*
10-key numeric pad
Tactile feedback*

Display Screen
High-resolution (720h x 350v)*
80 characters x 25 lines
Upper and lower case
Green phosphor screen*
Diagnostics
Power-on self testing*
Parity checking*
Languages
BASIC, Pascal
Printer
Bidirectional*
80 characters/second
12 character styles, up to 132 characters/line*
9 x 9 character matrix*

Color/Graphics
Text mode:
16 colors*
256 characters and symbols in ROM*
Graphics mode:
4-color resolution: 320h x 200v*
Black & white resolution: 640h x 200v*
Simultaneous graphics & text capability*
Communications
RS-232-C interface
Asynchronous (start/stop) protocol
Up to 9600 bits per second

Getting started is easier than you might think, because IBM has structured the learning process for you. Our literature is in *your* language, not in "computerese." Our software *involves* you, the system *interacts* with you as if it was made to—and it was.

That's why you can be running programs in just one day. Maybe even writing your *own* programs in a matter of weeks.

For ease of use, flexibility and performance, no other personal computer offers as many advanced capabilities. (See the box.)

But what makes the IBM Personal Computer a truly useful tool are software programs selected by IBM's Personal Computer Software Publishing Department. You can have programs in business, professional, word processing, computer language, personal and entertainment categories.

You can see the system and the software in action at any ComputerLand® store or Sears Business Systems Center. Or try it out at one of our IBM Product Centers. The IBM Data Processing Division will serve those customers who want to purchase in quantity.

Your IBM Personal Computer. Once you start working with it, you'll discover more than the answers and solutions you seek: you'll discover that getting there is half the fun. Imagine that. IBM®

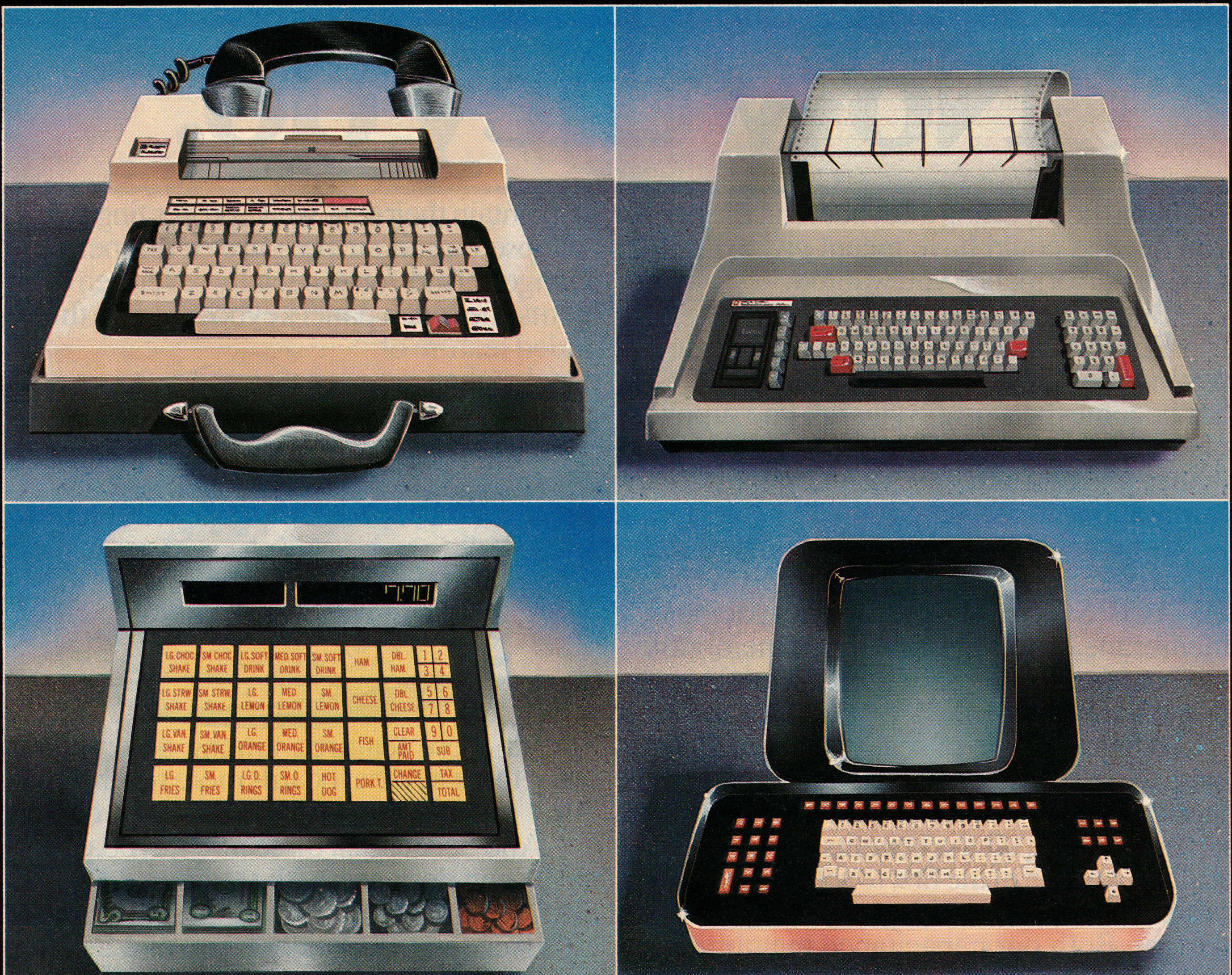
The IBM Personal Computer and me.

---

†This price applies to IBM Product Centers. Prices may vary at other stores.

For the IBM Personal Computer dealer nearest you, call (800) 447-4700. In Illinois, (800) 322-4400. In Alaska or Hawaii, (800) 447-0890.

Wouldn't it be great if every kind of keyboard had our kind of performance?


LG. CHOC. SHAKE
SM. CHOC. SHAKE
LG. SOFT DRINK
MED. SOFT DRINK
SM. SOFT DRINK
HAM
DBL. HAM.
1
2
3
4
LG. STRW. SHAKE
SM. STRW. SHAKE
LG. LEMON
MED. LEMON
SM. LEMON
CHEESE
DBL. CHEESE
5
6
7
8
LG. VAN. SHAKE
SM. VAN. SHAKE
LG. ORANGE
MED. ORANGE
SM. ORANGE
FISH
CLEAR
9
0
AMT. PAID
SUB
LG. FRIES
SM. FRIES
LG. O. RINGS
SM. O. RINGS
HOT DOG
PORK T.
CHANGE
TAX
TOTAL

SC Series Capacitance Membrane Keyboard

MICRO SWITCH
a Honeywell Division

KD Series Touch Panel Keyboard

SD Series Hall Effect Keyboard

CT Series Contact Membrane Keyboard

Now they do.

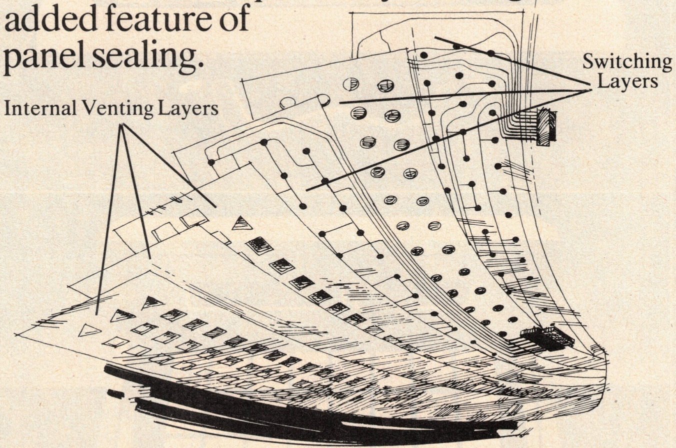
Until now, getting a keyboard at the price you needed could have meant giving up the kind of performance you wanted.

But not anymore.

Because, with the introduction of three new membrane keyboards, MICRO SWITCH has become the world's only full-line supplier of reliable keyboards. We offer a high-performance and cost-effective solution for virtually any application.

Now, in addition to our time-proven Hall effect offerings, you can specify MICRO SWITCH SC Series full-travel capacitance membrane or CT Series contact membrane keyboards, and KD Series touch panel membrane keyboards.

Whatever type of seal you need, all you have to do is ask. The capacitance membrane units are the world's only capacitance keyboards with all the benefits of membrane sealing. And we're the first to solve the venting problems associated with previous membrane designs. Both our capacitance membranes and contact membranes are internally vented to maintain their seal while preventing switch collapse due to air pressure or temperature changes. And for especially severe environments, the touch panel keyboards give the added feature of panel sealing.



It's those features, among others, that make these new keyboards more reliable than other capacitance and hard-contact designs.

And because all three new keyboards have been designed with traditional MICRO SWITCH quality and reliability, each carries a 1% Acceptable Quality Level and 2-year warranty.

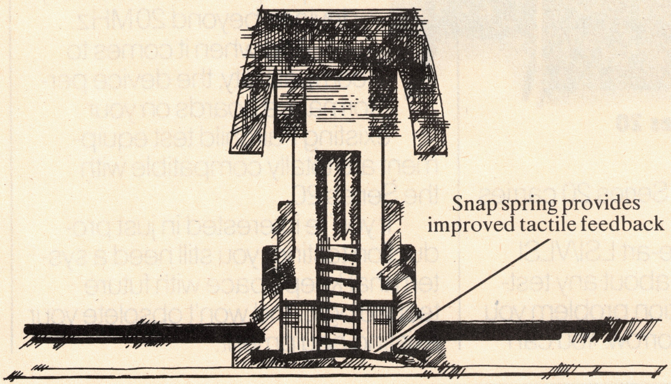
Now any combination of keyboard features you can name can have the MICRO SWITCH name on it.

Now your keyboard specifications are only limited by what you want. Not by what you can get.

Our full-travel series, for example, are available in a wide variety of keyboard configurations, with a choice of over 40,000 legends.

Because legends are screened on our touch panel designs, the graphic possibilities are endless. And, we can combine full-travel and touch panel actuation in a single assembly, featuring either capacitive or hard contact technology.

We make it easier to comply with European standards, because our full-travel membrane designs are available in low-profile versions to meet world requirements.



And, the actuator module for the full-travel membrane keyboards helps achieve new levels of tactile feedback and operator satisfaction.

So you can come to MICRO SWITCH for the keyboard technology, travel, actuation, sealing, appearance, profile, electronics, and special features you need.

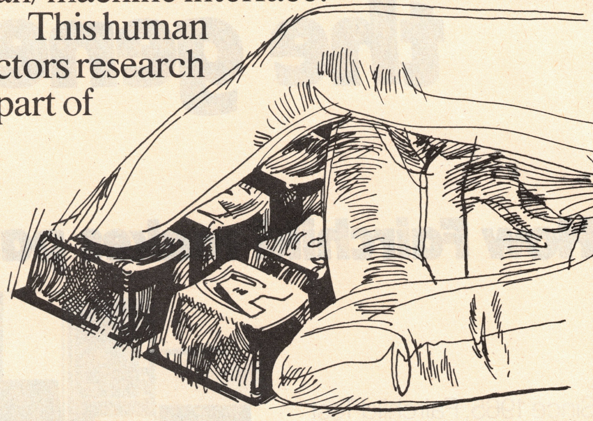
And get them all – backed with the experience and full application support that's been a MICRO SWITCH tradition.

Being able to design a keyboard to fit any application is important. But doing it to fit any operator is imperative.

It's important to understand that half of any keyboard application is a human being. There's probably no keyboard manufacturer who understands that better than MICRO SWITCH.

Our unique human factors research – an intensive, on-going program for over 20 years —has given us the tools to develop industry standards for key speeds and multi-key rollover; tactile, visual, and audible feedback; and various keytop shapes, spacing, configurations and travel. We're continually improving the man/machine interface.

This human factors research is part of what makes our keyboards unique. And it's part of every keyboard we make.



Instead of resting on our laurels, we're relying on our research.

Being able to add state-of-the-art capacitance membrane, contact membrane, and touch panel keyboard types to our Hall effect offerings is the result of extensive planning, research and testing.

But it's only the beginning.

Each of these keyboard types will be continually subjected to the refinements growing from our human factors research, customer feedback, and our unmatched R&D facilities which include backup by our Honeywell corporate facilities.

Also, every keyboard customer benefits from a manufacturing capability that stands unmatched: it's large enough to handle the most extensive order; responsive enough to give the modest order the same kind of intensive, individualized and quality-conscious attention.

All of these efforts are to make sure that, as your keyboard needs change and grow, you'll always have the choice of a progressive alternative with one unchanging feature: the MICRO SWITCH name. With all the performance that name implies.

For more information on our keyboard technologies, call 815-235-6600. Or write,

MICRO SWITCH, the
Keyboard Consultants,
Freeport, IL 61032.

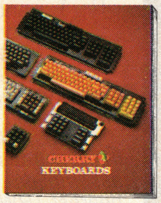
MICRO SWITCH
a Honeywell Division

Circle 187 on reader service card

The keyboard switch with a heart of gold

...keeps your product WORKING year after year...after year. In your keyboard or ours, Cherry key switches just don't fail. The knife-edge contact area is so small (9 millionths of a square inch)... the contact pressure so great (about 5,000 psi) ... the gold alloy so pure and film-free... that you are assured of positive contact every time. For 50 million operations and beyond. (Which is probably beyond the life expectancy of your product!)

Cherry "heart of gold" keyboard switches are available individually or with two-shot molded keycaps. Hopefully, you want keycaps. Because, *we have keycaps* ... in more legends, sizes, type faces than you're likely to find anywhere else. Sculptured keycaps? We've got 'em. Gloss or matte finish? We've got *both.* Colors? Lighted? Specials? Sure! Some "off the shelf"... all at prices that make it obvious why the *Cherry* way is the *economical* way to put a heart of gold in any keyboard.



Get this 32 page, full color catalog of Cherry keyboards, keyboard switches and keycaps. Yours free for the asking.

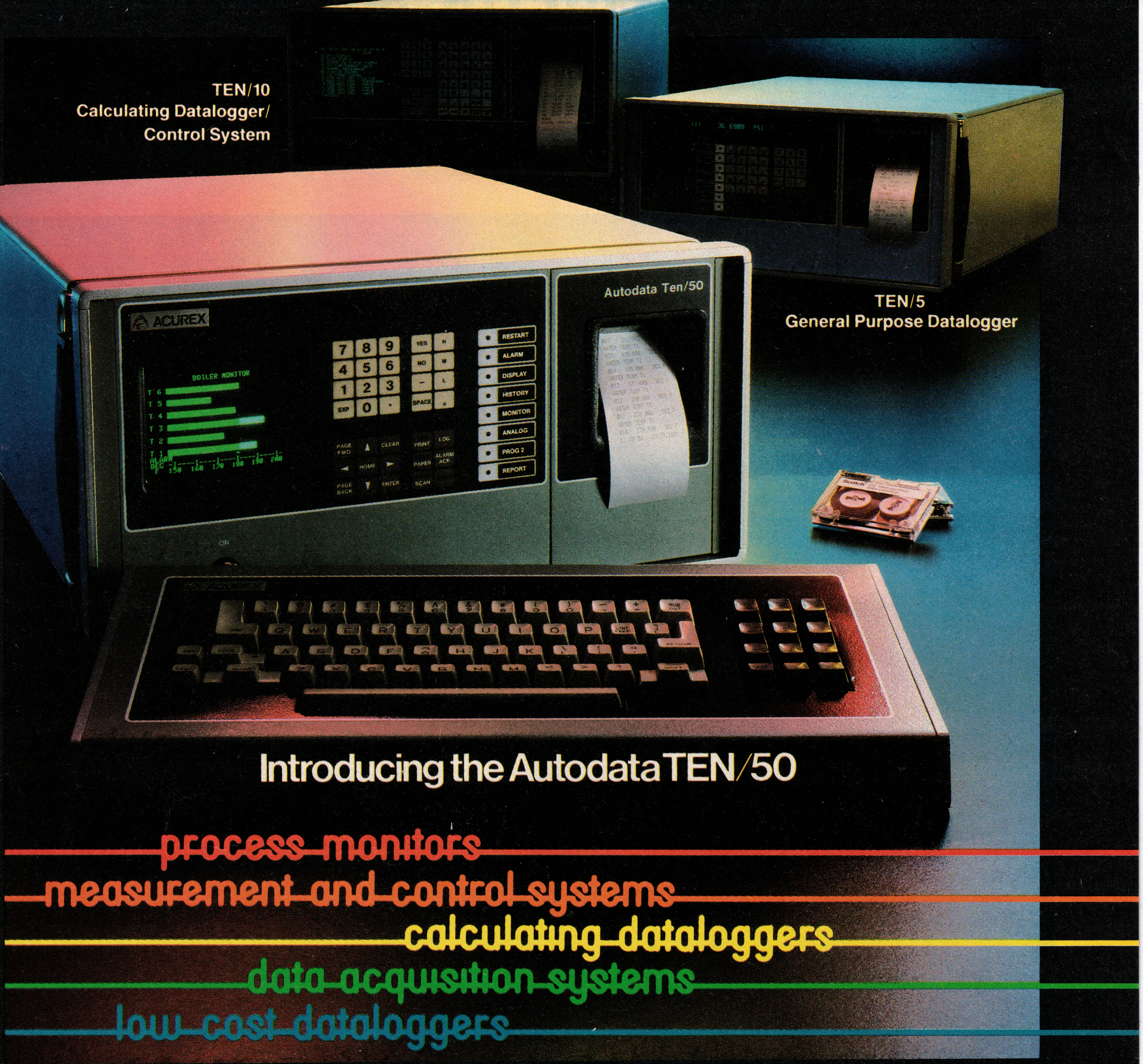
CHERRY®

Cherry switches now available locally from distributors.

CHERRY ELECTRICAL PRODUCTS CORP., 3608 Sunset Avenue, Waukegan, IL 60085

Circle 13 on reader service card

BASICPAC™
A New Concept in Industrial Measurement and Control Systems


TEN/10
Calculating Datalogger/
Control System
ACUREX
BOILER MONITOR
Autodata Ten/50
TEN/5
General Purpose Datalogger
Introducing the Autodata TEN/50
process monitors
measurement and control systems
calculating dataloggers
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low cost dataloggers

- Friendly Operator Interface
- Computer Power with Instrument Simplicity
- BASICPAC™ plus Menu for Quick Startup
- Software programmable Operator Interface
- On Board Tape Storage
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The A-TEN/50 is a unique new Measurement and Control System which provides the accuracy and high noise rejection you need plus computer processing power. Unlike many "computer" systems, our BASICPAC™ program gets you up and running fast. Menu programming lets you measure and record data without specialized programming. Then create your own custom program in BASIC, and you're on line to your solution. With RS-232, pulse, thermocouples, RTD, 4-20 mA and BCD inputs plus on board tape, we are sure you will find a solution in the TEN/50.

Give us a call and let us help you solve your next Measurement and Control problem.

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Autodata Division
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Circle 89 on reader service card

Finally. Big system power in

Whether it's laboratory testing, production automation or computation and analysis, Hewlett-Packard's newest computer systems put high-powered engineering performance into easy-to-configure, easy-to-use workstations. So you can solve your applications problems just the way *you* want to. And a lot sooner than you might have thought possible.

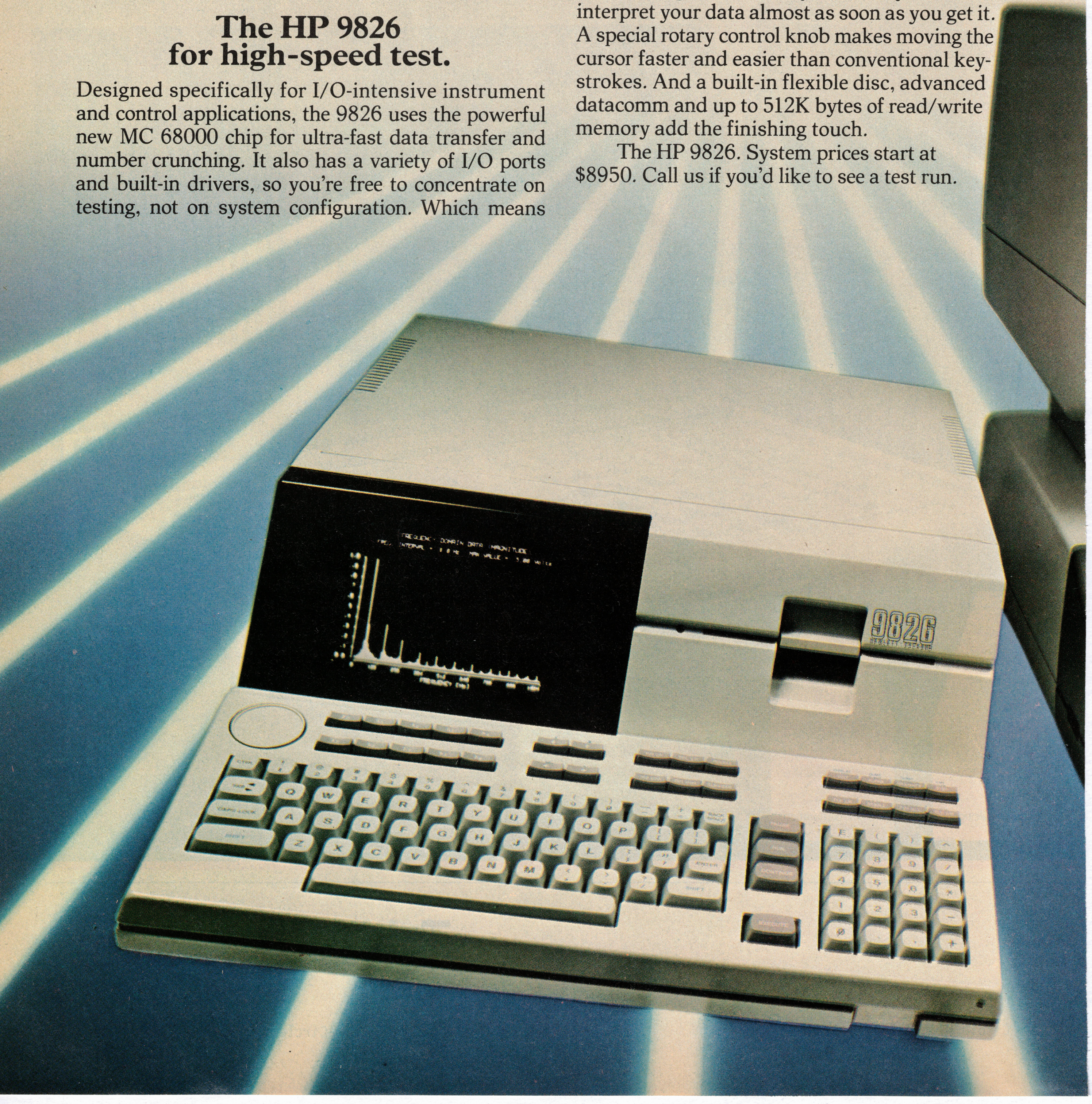
The HP 9826 for high-speed test.

Designed specifically for I/O-intensive instrument and control applications, the 9826 uses the powerful new MC 68000 chip for ultra-fast data transfer and number crunching. It also has a variety of I/O ports and built-in drivers, so you're free to concentrate on testing, not on system configuration. Which means you can get your solutions up and running in days, instead of weeks or months.

But the 9826 makes it easier still. Because you can run your programs in any of three languages: HP-enhanced BASIC, HPL, or PASCAL.

We also built a CRT display and advanced graphics right into the system, so you can see and interpret your data almost as soon as you get it. A special rotary control knob makes moving the cursor faster and easier than conventional keystrokes. And a built-in flexible disc, advanced datacomm and up to 512K bytes of read/write memory add the finishing touch.

The HP 9826. System prices start at $8950. Call us if you'd like to see a test run.



small, easy-to-use computers.

The HP 9845 for high-performance design.

With a broad range of advanced capabilities (including new options offering three times the computational speed of the basic system), the HP 9845 can be configured to meet your precise needs—from finite element analysis to simulations and modeling. And almost anything in between.

The key is flexibility. You can choose from among 14 different configurations, including a color display and 448K bytes of read/write memory. Then, attach a hard disc, printer, plotter, or other peripherals. And with the 9845's advanced datacomm capabilities, you can even share technical information with other computers in distributed processing environments.

The HP 9845. System prices start at under $20,000. Call us if you've got similar designs.

All of our computers are backed by HP's worldwide service organization. For more information, call your local HP sales office listed in the White Pages. Or write to Hewlett-Packard, Attn: Pat Welch, Dept. 06108, 3404 E. Harmony Rd., Ft. Collins, CO 80525.

You can attend an in-depth seminar on "Computer-Aided Engineering" *free* at Productivity '82. Watch your newspaper for more details.

When performance must be measured by results.

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FRIENDLINESS.
Informative HP manuals, helpful error messages, and automatic syntax checking make BASIC language programming easy.

EXPANDABILITY.
Just plug in the HP interface bus (HP-IB) and add up to 14 peripherals without disassembly.

12-DIGIT ACCURACY.
(Not just 9!) Thanks to BCD math capability.

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Edit the easy way – without retyping entire statements. Insert, change, or delete characters at the touch of a key.

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Powerful, time-saving solutions to your everyday problems.

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Keyboard, CRT, printer and storage – all in a 20-lb. package. So you'll have computing power wherever you need it . . . office, lab, field, or home.

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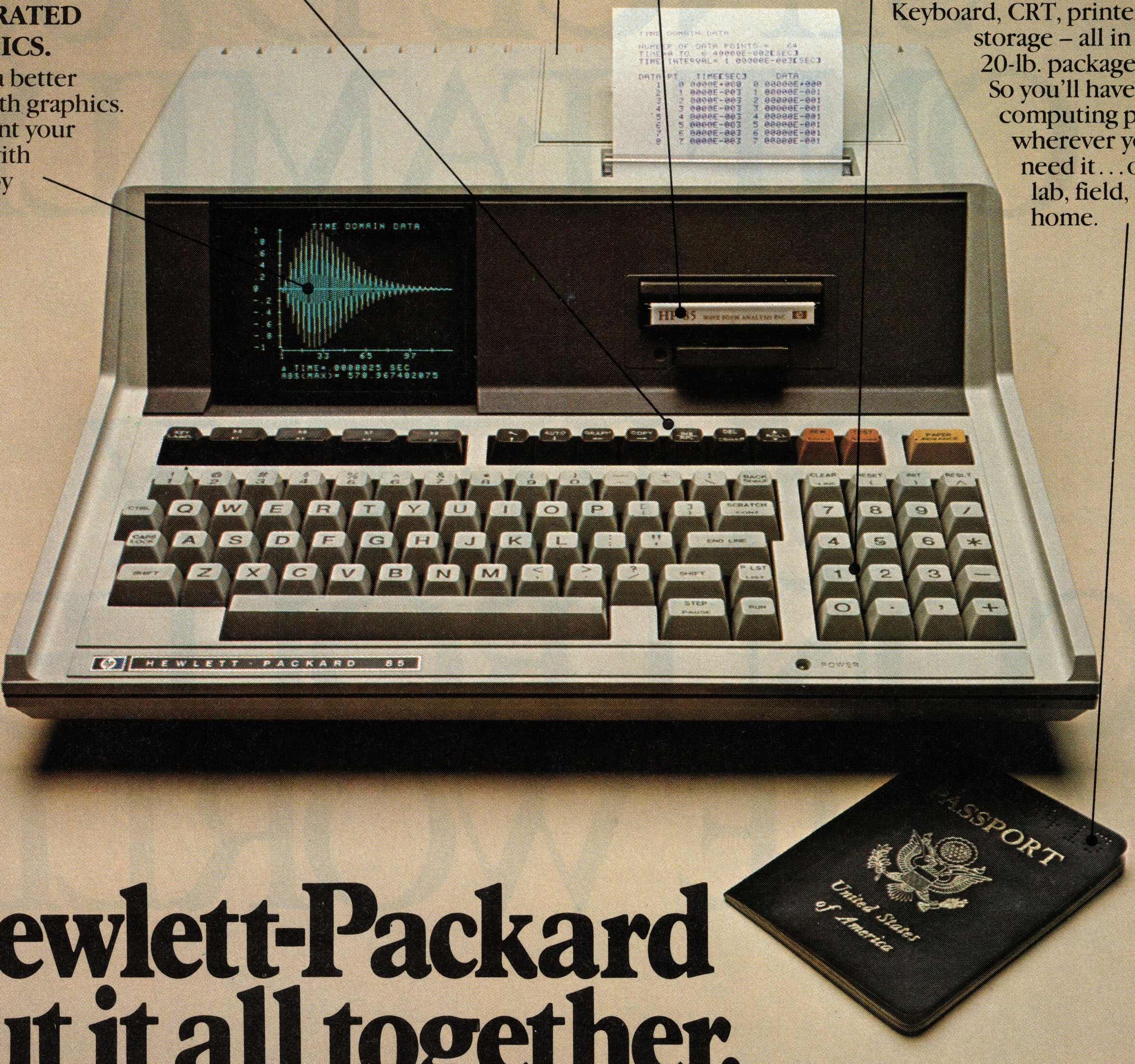
Analyze a better way – with graphics. Document your results with hard-copy plots.



Hewlett-Packard put it all together.

The HP-85 personal computing system.

Leave it to Hewlett-Packard to put a lot of power in a little package. Plus flexibility, portability, and all the other features you'd expect to find in a personal, professional, integrated computing system.

Turn it on and the HP-85 is ready to go. You're off and running using HP software or creating your own programming solutions. There's no bootstrapping. And since the operating system and powerful BASIC language exist in ROM, they use almost none of the available RAM.

If you've been looking for a friendly, integrated computer with power and dependability, look at the HP-85.

We put it all together for you!

For further information, phone toll-free, 800-547-3400, Dept. 214N, except Alaska/Hawaii. In Oregon, call 758-1010. Or, write Hewlett-Packard, Corvallis, OR 97330, Dept. 214N. 611/22

When performance must be measured by results.

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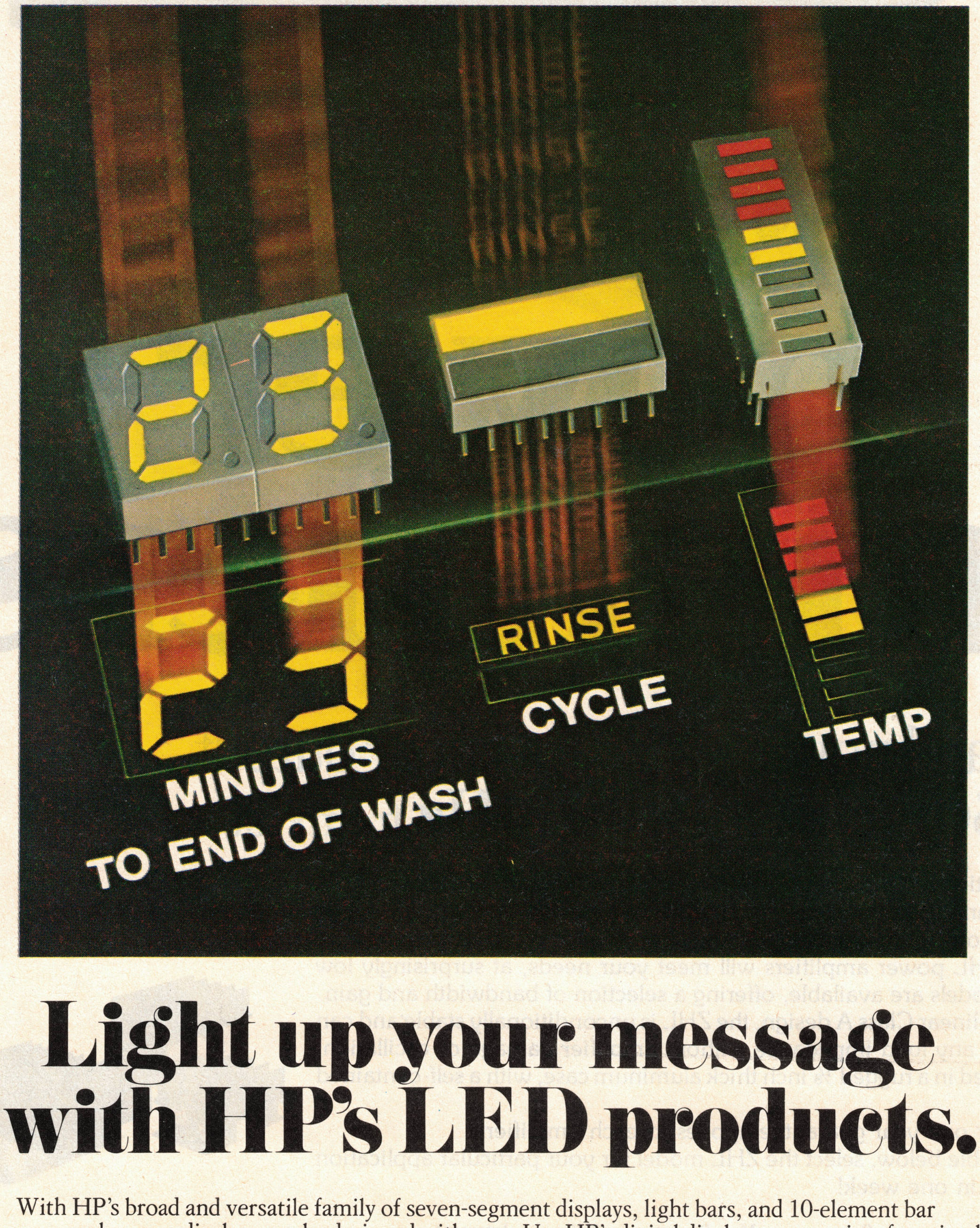
SURPRISE!



Light up your message with HP's LED products.

With HP's broad and versatile family of seven-segment displays, light bars, and 10-element bar graphs, your displays can be designed with ease. Use HP's digital displays, annunciate function light bars and analog bar graphs in any combination to conveniently display complete information in compact, attractive packages. For example, look at the effective combination of HP's HDSP-5701, 14.1mm (0.56 inch) seven-segment display, with the HLMP-2735 light bar and HDSP-48X0 series bar graph array.

All displays are TTL compatible, eliminating the need for extra power supplies in your display system. All offer HP's proven reliablity and quality.

For HP's whole colorful story on LED products, or immediate delivery, call your local HP components distributor. In the U.S., contact Hall-Mark, Hamilton/Avnet, Pioneer Standard, Schweber, and the Wyle Distribution Group. In Canada, call Hamilton/Avnet or Zentronics, Ltd.

HEWLETT PACKARD

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The Lexidata System 3400 Display Processor and full line of interactive peripheral devices are designed specifically for OEMs and sophisticated end-users. The System 3400, rapidly becoming the leader, with over 1,000 units shipped to date, possesses the product characteristics required by this demanding customer group.

- System 3400 *performance* is truly outstanding. Only the System 3400 offers 1280x1024 resolution at 60Hz non-interlaced black-and-white and grayscale capability, or 880x704 resolution at 60Hz non-interlaced color. Our programmable lookup tables are the industry standard of performance. Double buffered memories or multiple lookup tables with bank switchable memories and processor features, such as pan/zoom and 4K WCS, are available.
- System 3400 *quality* satisfies the requirements of Fortune 500 companies, the leading CAD/CAM systems vendors and military and government contractors. We continue to focus on quality because we believe that quality and cost effectiveness are closely related.
- System 3400 *flexibility* ensures a configuration to meet the exact requirements of each customer. The System 3400 offers a complete range of OEM configurations, starting from $7,540, including monitor.
- System 3400 *software* provides a high-level language user-interface to execute graphics and imaging functions. The powerful subroutine library streamlines application software development and facilitates user interaction.
- System 3400 *cost effectiveness* enables even price-sensitive OEMs to configure a highly competitive product. You will be able to maximize your value-added contribution and optimize your overall system performance.

For more details, call (617) 663-8550 or write to us at 755 Middlesex Turnpike, Billerica, MA 01865. TWX 710-347-1574.

LEXIDATA CORPORATION

Circle 80 on reader service card

LEXIDATA

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